TUMOR OF THE OBLONGATA PRESENTING ATAXIA AND ASTEREOGNOSIS AS THE MOST PROMINENT EARLY SYMPTOMS.*

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The following case, both because of the infrequency of tumors involving the medulla and because of certain unique features in the symptomatology, deserves to be placed on record.

A.M.; aged 26; female; married; first came under the observation of the writer on September 19, 1898. She complained more especially of inability to properly use the right arm.

Family History.—The family history was negative, especially as regards nervous diseases. The father and mother of the patient were living and well. Two brothers and one sister were living and well. No deaths had occurred in the generation to which the patient belonged.

Personal History.—The patient could not remember any illness of moment occurring during childhood. Menstruated at fourteen and continued to be perfectly well up to fifteen years of age, when she was attacked by pain in the right side of the neck. The neck became very stiff and the pain gradually increased until it attained a very high degree of severity. Both the rigidity and the pain resisted for the time all efforts at treatment and persisted for about a year. The pain then gradually subsided and finally disappeared and with it the rigidity. Subsequent to this attack the patient continued to be entirely well until about two years ago when pain again made its appearance in the right side of the neck. As far as she can remember, it was in exactly the same situation as before, and just as on the former occasion it was attended by stiffness of the neck. This attack lasted six months. However, unlike the former attack, neither the pain nor the rigidity, although they somewhat improved, ever entirely disappeared. There has been ever since more or less pain in the right side of the neck. This condition persisted without change until three months ago, when the patient began to feel in addition some numbness in the fingers and thumb of the right hand. A little later the fingers and hand began to feel stiff and awkward and she began to drop various articles which she attempted to hold. A sense of stiffness and of weight subsequently spread over the hand up to the shoulder, involving the entire arm. She has not been able to play the piano for about three months. She noticed also three months ago that she could not write as well as formerly, and this difficulty has steadily increased.

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* Read at the twenty-fifth annual meeting of the American Neurological Association, June 14 and 15, 1899.

The patient states that she was married at twenty years of age, that she has had two miscarriages, but no living children. There is no history of alcoholism.

Present Condition.—September 19, 1898. The patient states that her general health has failed somewhat; that her sleep has become disturbed; that her appetite has become poor; that the right arm has a "numb and dead feeling," and that this feeling extends from the tips of the fingers up as far as the right side of the neck, and that this numbness is associated with a sense of stiffness. She also states that her neck feels somewhat stiff at present, and that when she goes to move the head, her neck "catches her." In making this statement, she indicates the origins of the trapezius and sterno-mastoid muscles.

Station with eyes closed reveals a slightly exaggerated sway. In walking the patient betrays a barely perceptible awkwardness in the use of the right leg. Otherwise the gait is normal. She stands very well upon the left leg alone; stands upon the right leg alone, but makes a much greater effort at balancing. The right knee-jerk is exaggerated. There is also present a right ankle-clonus, but it rapidly dies out. The left knee-jerk is also exaggerated, but less markedly than the right. There is no ankle-clonus on the left side. The elbow and wrist jerks are present and somewhat pronounced, equally so upon both sides.

The right arm is moved freely in all directions at the shoulder joint, but with an appearance of effort and awkwardness. The arm is also readily flexed and extended at the elbow, but on attempting forcible flexion of the biceps the arm is found to be not as strong as its fellow. Movements of the wrist are performed in all directions, but the extensors are weaker than those of the left side. Grip of the right hand registers 22; left hand, 35. Movements of the fingers are executed freely, but like the movements of the arm, they are decidedly ataxic. The movements of the arm as a whole, as shown by efforts to touch the nose or chin with the eyes closed, are decidedly ataxic. The handwriting is very irregular and hardly legible. The movements of the left arm and hand are in every respect normal. Patient is right-handed.

Examination as to sensory changes reveals no anomalies in the face, trunk, the left arm or either leg. In the right arm and hand a detailed examination reveals that the tactile sense, temperature-sense and the pressure-sense are well preserved. The pain-sense is slightly diminished over the forearm, hand and fingers. It is noticed also that the patient makes frequent errors of location of the tactile impressions. She also makes occasional errors in describing the position in which the arm, hand or fingers are placed. In testing her muscular sense by means of objects of various weights, it is found that the muscular sense of the right arm is greatly diminished or lost. It is now observed that the patient is also unable to recognize various objects placed in her hand when her eyes are closed, although she recognizes these objects promptly when placed in the left hand. In other words, there is complete loss of the stereognostic sense as regards the right hand. She can tell when a key or coin is placed in her hand, *i. e.*, she recognizes the presence of a foreign body, but is utterly unable to name or describe it. She can tell whether it is cold or warm and instantly recognizes its presence, but she cannot describe its shape or give any other information as to its physical qualities. In addition the right hand is very slightly tumid. This is noticeable in the fingers and thumb in which the wrinkles, especially of the middle and distal phalanges, are slightly less marked than those of the left hand. The hand as a whole looks somewhat smoother than the left.

Superficial or deep pressure over the spinal column fails to reveal any evidence of pain or tenderness. There is no inguinal, inframammary or other superficial area of hyperesthesia or tenderness. However, a patch of deep-seated tenderness, not marked, is discovered on the right side of the neck, immediately back of and over the upper third of the belly of the sterno-cleido-mastoid muscle. The patient states that this is the area in which she felt pain and stiffness in the neck both in the attack eleven years ago and the attack beginning two years ago. This pain sometimes spreads down the neck as far as the axilla. No tenderness is elicited over the brachial plexus or over the nerves of the arm. On asking the patient to move the head freely in all directions, it is found that the head is not rotated as freely as normally, either to the right or to the left, and also that the movement gives rise to "a catching pain." This is also true of the movements of flexion and extension. The limitations of the movements of the head and neck, while not marked, are unmistakable.

The electrical examination of the muscles of the right arm fails to reveal any reaction of degeneration. The muscles of the two arms respond equally; possibly those of the right arm respond a trifle more readily than those of the left to the same minimal current.

There is no involvement of the face, tongue or soft palate. The patient states that there is no sensation of numbness of the legs, feet or toes, or of the left arm. There is no headache or any pain whatever save that in the side of the neck. The patient is markedly constipated. The sphincters are normal. The examination of the special senses reveals no anomalies. The pupils respond normally. The eye-grounds are perfectly normal. There is no contraction of the visual fields. These findings were confirmed by Dr. de Schweinitz, who reported in addition that the color-fields were normal save a slight contraction for green.

The urine is negative.

October 12.—Is brought by her physician, who reports that she is taking potassium iodide in ascending doses; at present thirty-five grains three times daily. For five days past she has also been receiving two drachms of mercurial inunction daily. No traces of iodism or mercurialization are present. The right hand registers by the dynamometer, 22; the left, 35. Ataxia of right arm possibly a little more marked. Other symptoms as before. No loss of cutaneous sensibility other than the slight degree noted at the previous examination.

October 29.—The patient now complains of pain in the *left* side of the neck and upper part of the *left* shoulder. A patch of deep-seated tenderness is now revealed on the *left* side of the neck, above the sterno-cleido-mastoid muscle, in a position corresponding to that in which the patch is observed on the right side. There is now also undoubted, though very slight, ataxia in the movements of the *left* arm. The patient also complains of numbness of the left hand, involving more especially the ring and little fingers and the ulnar side of the hand and forearm. In the left upper arm also there is a band-like sensation of tightness or constriction. No loss of the stereognostic sense can, however, be detected on this side. The other symptoms are as before. The patient is now unable to describe the position of the right arm and hand at all, and she volunteers the statement that she "sometimes loses her hand in the bed."

November 7.—Since November 3 has begun to drag the right foot. Sway with eyes closed is exaggerated. The patient is unable to stand upon the right leg alone. She is, however, able to describe the various positions in which the leg is placed. Both knee-jerks are greatly exaggerated, the right slightly more than the left. The stiffness of the neck is now much more marked than at any previous time. Rigidity is noted upon attempting flexion, and especially extension. Since the last two or three days she is unable to extend the right arm at the shoulder. Loss of power in the right arm is now very pronounced. Flexion of the forearm is very feebly performed, and all the movements of the hand, while preserved, are feebler than before. Movements of the left arm not as readily performed as at last examination. This is due especially to weakness and to some slight increase in the ataxia noted before. The left hand now registers by the dynamometer 20, while the right hand registers 11.

Re-examined, November 14, at the patient's home. Patient is in bed. History since last visit at office is that there has been a gradual and increasing paralysis of the right arm and right leg, of the left arm, and finally of the left leg. No movement whatever can now be made in either arm. Very feeble movements can be made in the right leg at knee and toes. Movement in the left leg also excessively feeble, but a little better preserved than in the right. Elbow and biceps jerks preserved and equal on both sides. Right knee-jerk plus; left knee-jerk double plus. Feeble right ankle-clonus; left ankle-clonus pronounced and sustained. Cutaneous sensibility much lessened to all forms over both legs, especially over the right. Cutaneous sensibility also diminished over both arms, more especially over the right. Sensation now much diminished over the trunk. Over left half of the trunk, sensation is a little better preserved than over the right half. Sensation appears to be well preserved at the level of the clavicles. There is, however, no sharp line of demarkation. Impressions at the level of the nipples are perceived almost, but not quite, as readily as below the clavicles. Over the shoulders there is also a diminution of sensation, but not as marked as in the arms. Sensibility to all forms is well preserved over the neck, face and head. The pupils are equal and react to light. The eye-grounds are still normal. The patient complains of much stiffness in the back of the neck. On attempting to move the neck it is found that the rigidity noted in the former examination is more pronounced, and that attempts at passive movement give rise to pain. If the patient be raised without supporting the head, the latter falls backward or it sinks forward on the chest, as though the muscles of the cervical region were too weak to properly hold it up. Attempts at blowing or at straining produce no movement of the abdominal wall. The breathing is almost entirely performed by the upper portion of the thorax; no movement of the diaphragm can be detected. The respiration is 26; pulse 96. The face is dusky and flushed. There is occasional strangling on attempting to swallow food. Solid food cannot be swallowed at all. The temperature is normal. There is at present retention of urine and marked constipation.

November 15th, 4 P. M.—Patient has not slept all night, but fell asleep at 12 o'clock noon to-day and woke about 3. During the sleep there was a rattling in the throat, probably produced by the relaxation of the uvula. There is no motion of the alæ of the nose in breathing. The tongue is protruded straight. The face is symmetrical. The pupils are normal. The patient is cheerful and replies to questions put to her in short phrases. Condition about the same as at last examination, except that paralysis of the trunk and limbs is more pronounced. Constipation and retention of urine as yesterday.

Examined, November 16th, 4.30 o'clock.—The paralysis and sensory losses noted on previous occasions have become more pronounced. No sharp lines of demarkation exist between area of preserved sensation in the neck and the area of diminished sensation in the trunk. The sensation below the clavical and the regions of the breasts, for instance, is impaired, but passes by gradual transition to normal sensation when the neck is reached. Obstinate constipation continues. Temperature normal. Pulse 108.

Examined, November 17th, 8.45 o'clock.—Symptoms more pronounced. Sensory loss now involves the neck, extending up to the level of the lower jaw. Sensation appears to be normal in the upper half of the cheek and forehead. Along the sides of the head and back part of the head sensation appears to be very much impaired. The pupils are a trifle dilated. A rise of temperature, 101°, has been noted since morning. Symptoms otherwise unchanged. Pulse 112.

Examined, November 18th, 4 P. M.—Face livid, bluish red, somewhat tumid. Temperature 105°. Pulse 120. Respiration hurried, feeble and shallow. Pupils slightly more dilated than at previous examination. Patient much confused mentally; delirious. Does not recognize persons about her. Is evidently dying.

Died November 18th, 4.30 P. M.

Autopsy November 20th, 1898, 9 A. M.

The calvarium presents no abnormality. The dura is not adherent or thickened. Some slight deposit of dark red granular material is found on the pia matter upon either side of the margin of the longitudinal fissure. It is easily scraped off with the finger-nail, and is more especially noticeable in the right hemisphere, upon the central convolutions, but is not limited to these areas. Subsequent microscopical examination revealed this granular matter to be altered blood pigment, and also that the pia was infiltrated with it. The pia and cortex are in every other respect normal. On removing the brain from the cranium a large irregular mass, springing from the occipital bone on the right side of the junction of the pons and medulla oblongata, and forming a slight depression in the right lobe of the cerebellum, is revealed. The right vertebral artery is occluded from pressure. The medulla oblongata is markedly distorted, the greatest distortion occurring at the lower part of the inferior olive. The right olive is elongated antero-posteriorly, while the left is more nearly of the normal shape. A transverse section of the medulla oblongata in its largest portion antero-posteriorly measures 2.2 cm. and laterally 1.3 cm.

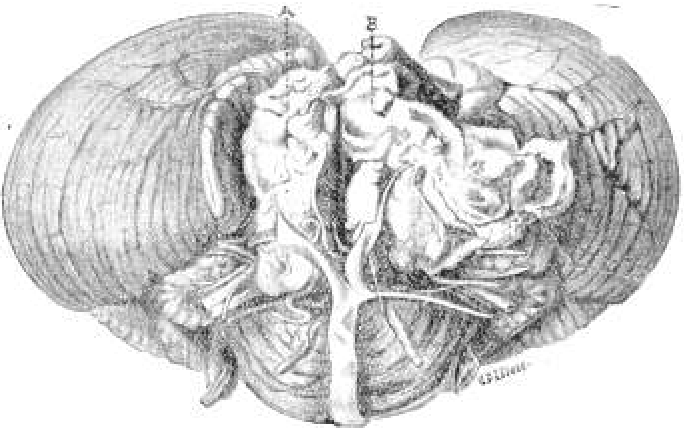

Fig. I.—A, medulla oblongata; B, tumor pushing the medulla oblongata to the left.

The distortion caused a projection of the right anterior pyramid beyond the left, and of the right posterior columns posteriorly beyond the left. The greatest pressure appeared to have been exerted on the median portion of the right side of the medulla oblongata, although the entire right side showed the effects of pressure. The pia of the medulla oblongata was infiltrated with altered blood pigment as the portion of the cortical pia already described.

Microscopical examination failed to reveal any degeneration by Weigert's hematoxylin method or the carmine stain, but the employment of the Marchi stain gave more successful results. Sections stained by the Marchi method show a degeneration of myelin sheaths, which is most marked just below the area of greatest compression; it is therefore most distinctly seen at the lower part of the motor decussation. The posterior and lateral columns at the level of the lower part of the motor decussation are much degenerated, and the left side appears to be as much affected as the right. The left anterior pyramid reveals a little more degeneration than the right. Distinct degeneration is seen in the area of the right direct cerebellar tract while in the corresponding area on the left side no degeneration can be seen. The degeneration seen at the motor decussation does not extend very far downward or upward. At the junction of the pons and medulla all evidences of the degeneration have disappeared. Similarly sections taken from the upper cervical cord and stained by the Marchi method show no alteration. It should be added, however, that the piece of the cervical cord immediately joining the medulla was not removed at the autopsy. The alteration of the myelin at the motor decussation, as seen by the Marchi method, is possibly

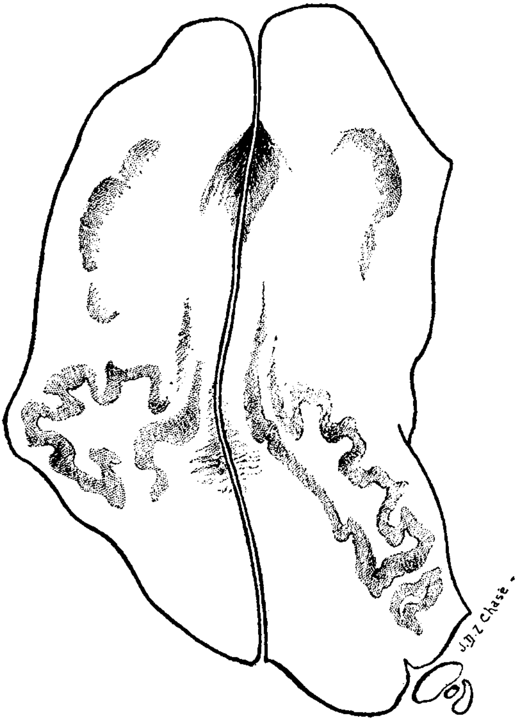

Fig. II.—Section from the medulla oblongata at the point of greatest compression. The lower olive on the side of the tumor is elongated from pressure.

the same as that produced after death when the nervous tissues are handled carelessly or injured, but in this case the lesion seems undoubtedly to have been the result of pressure *intra vitam.*

Fibers from a posterior lumbar root in the upper part of the lumbar swelling, stained in the fresh state with osmic acid, and teased, appear to be normal. This examination was made on account of the frequently reported degeneration of the posterior roots in brain tumor.

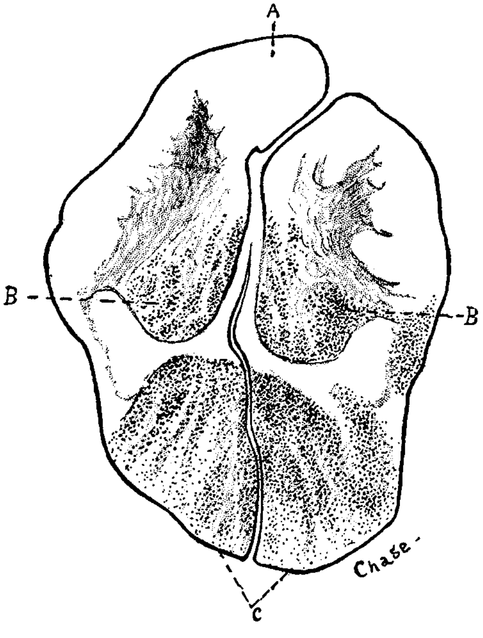

Fig. III.—Section from the lower part of the medulla oblongata. A, anterior pyramid; BB, motor decussation; C, posterior columns. The dots represent the degenerated fibers shown by the Marchi method.

Sections from the lumbar region, stained by the Marchi method, show no degeneration of the posterior roots.

Microscopical examination of the tumor showed it to be a chondrosarcoma.

It is interesting in connection with these findings to briefly review the early symptoms of the case. It will be remembered that these consisted especially of ataxia of the right arm, some weakness of the muscles, loss of the muscular sense, loss of the sense of position of the limb, slight diminution of the pain-sense and some disturbance of the sense of tactile localization. The other cutaneous sensibilities, tactile sense, temperature-sense and pressure-sense were normal. There was also very slight ataxia of the right leg. It is extremely probable that the motor weakness is directly related to the pressure upon the right motor tract, immediately below the decussation. The cutaneous sensory disturbances are in all probability to be ascribed to pressure upon the right posterior columns. It is also probable that the ataxia, loss of muscular sense and sense of position of the limb, are to be referred to pressure upon the right direct cerebellar tract. This tract, it will be remembered, as seen in the sections, is decidedly degenerated. It is further probable that the symptom of astereognosis is to be ascribed to the partial sensory losses which interfered with the complete perception of the qualities of the objects handled, and thus prevented a complete mental picture being formed in the cortex. Astereognosis has never before been observed as a symptom in tumor of the medulla. In fact, in all of the cases thus far reported in which astereognosis has been noted, a cerebral lesion was either definitely determined or the symptoms pointed unmistakably to the cerebrum as the seat of disease. Thus Wernicke's,[1] Monakow's,[2] Burr's,[3] and Dubbers',[4] cases resulted from trauma of the head, while Olmstead's,[5] Sailer's,[6] Williamson's,[7] and Vorster's[8] cases were all due to various lesions of the brain.

It is not within the province of this paper to enter into a detailed discussion of the subject of astereognosis. This was investigated by Hoffmann[9] in 1883, who studied the subject quite extensively. Since Hoffmann's thesis appeared merely a limited number of cases presenting astereognosis have been reported. Recently, however, Sailer[10] has again written upon the subject. According to Hoffmann a large number of factors enter into sterognostic perception; for instance, the tactile sense, the sense of localization of tactile impression, the space- or distance-sense (Raumsinn), the pressure-sense, the muscular sense, the temperature-sense, the pain-sense, the sense or knowledge of the position of the fingers to each other and to the hand, the recognition of passive movements and the knowledge of active movements. It can readily be seen that the faculty of perceiving objects by means of the hand is an exceedingly complex one. The various impressions received from all of the sources enumerated by Hoffmann, and perhaps others, are combined in the cortex to give rise to a mental picture of the object felt. It can readily be understood that if there be an elision of some of these impressions, this mental picture cannot be formed. The relative importance of the various impressions has as yet not been satisfactorily determined. Hoffmann states that the temperature-sense, the pain-sense, the tactile sense, the sense of position of the limb and the appreciation of the weight of bodies may be preserved, although the stereognostic sense is lost. The ability to appreciate the distance between two points, the sense of pressure, the recognition of the movements of the joints, and the recognition of the relative position of the fingers are, in Hoffmann's judgment, more important, for he says that in not one of his cases in which any one of these senses was preserved was the stereognostic sense lost. A diminution was, however, several times noted by him with almost complete integrity of one of these senses, and even at times of two. He states, on the other hand, that each one of these senses may be diminished to a marked degree without the stereognostic sense suffering in like degree, and further that the involvement of all of these senses does not necessarily involve the stereognostic sense. As regards the faculty of appreciating distance on the cutaneous surface, he says that the stereognostic sense may be entirely intact, although this faculty be diminished, and on the other hand may suffer severely when this faculty is normal. Again, complete loss of this faculty is not followed by absolute loss of the stereognostic sense. He also found that the stereognostic sense may be intact with greatly impaired pressure-sense, and with perfectly preserved pressure-sense may be lost. It can readily be seen from Hoffmann's results that the various elements entering into stereognostic perception are of variable value, and are possibly to some extent interchangeable. No one sense, but a combination of many, is necessary to stereognostic perception. Sailer, correctly it appears to the writer, gives more importance than does Hoffmann to the tactile-localization sense.

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[1] Wernicke, "Arbeiten aus der psychiatrischen Klinik, in Breslau," Leipzig, 1895.—Also Monakow, "Gehirnpathologie," Nothnagel, Wien, 1897, p. 409.

[2] Monakow, "Gehirnpathologie," Nothnagel, Wien, 1897, pp. 410 and 411.

[3] Burr, Journ. Nervous and Mental Disease, Jan., 1898.

[4] Dubbers, Neurologisches Centralblatt, 1897, p. 61.

[5] Olmstead, Journ. Nervous and Mental Disease, Nov., 1898.

[6] Sailer, Journ. Nervous and Mental Disease, March, 1899, p. 161.

[7] Williamson, British Med. Journ., 1897, II, p. 787.

[8] Vorster, Archiv. f. Psych., Bd. XXX, No. 2, 1898, p. 341.

[9] Herman Hoffmann, "Stereognostische Versuche," Inaug. Dissertation, Strassburg, Konstanz, 1883.

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[10] Loc. cit.

In the case here reported there was, in addition to ataxia, distinct loss of the muscular sense, loss of the sense of the position of the limb, diminution of the pain-sense and disorder of the localization of tactile impressions. It can readily be understood, therefore, that although the tactile sense, the pressure-sense and the temperature-sense were well preserved, the faculty of perceiving foreign bodies was lost.

It is exceedingly probable, as already stated, that the ataxia, loss of the muscular sense and of the sense of position of the limb are to be referred to the degeneration of the direct cerebellar tract. It is not improbable also that the disorder of sensory location was due to pressure upon the right posterior columns, the interference of function, however, being so slight as merely to produce *confusion* of tactile impressions instead of tactile loss. The degenerations noted in the motor tracts and posterior columns of both sides are probably of very recent origin. This is proven not only by the failure of the Weigert method and the carmine stain to demonstrate them, but also by the history of the case. It was merely twenty days before death that any symptoms were noted referable to the *left* arm, and then they were so slight as to be barely appreciable. It was not until fifteen days before death that these symptoms became at all distinct, and not until five or six days before death that the patient became markedly paraplegic from the neck down.

In its general features, especially as regards the pain and rigidity of the neck and exaggeration of the deep reflexes, the case recalls the tumor of the upper cervical cord reported by

Dr. Collins;[11] in its special features it recalls the case of glioma of the medulla oblongata reported by Dr. Collins,[12] in which there was paresis, distinct ataxia, exaggerated tendon-reflexes and ankle-clonus, more particularly of the left side, together with loss of the pain-sense and with preservation of the temperature- and tactile sense. In Dr. Collins' case, like the one here reported, there was also no optic neuritis. The feature of ataxia of the arm and slight ataxia of the leg recalls the case reported by Higier,[13] which was probably one of thrombotic softening of the medulla; the patient presented ataxia of the left extremities. The lesion was apparently due to syphilis, improved under specific treatment, and was, therefore, not verified by autopsy.

The symptoms, however, leave no doubt as to the probable situation of the lesion. The case here reported also recalls that of Wenhardt[14] of myxochondrosarcoma of the base of the cranium compressing the left hemisphere of the cerebellum, the medulla and pons, and giving rise to pain in the back of the neck, paroxysmal pains in the head, impaired movement of the head, hemiatrophy of the tongue, difficulty of swallowing and exaggerated knee-jerks. In Wenhardt's case there were, however, no sensory disturbances. Optic neuritis also was absent. It further recalls the case reported by Eskridge,[15] in which there was an intradural sarcoma extending from the upper portion of the cervical cord into the skull through the foramen magnum. In addition to paraplegia there was present exaggeration of the knee-jerks, loss of the tactile and temperature-sense below the inferior maxilla, and in addition to these changes also loss of the pain-sense in the arms and legs; there was no optic neuritis.

On October 24th, 1898, the writer presented this case *intra vitam* before the Philadelphia Neurological Society. The possibility of a lesion of the cortex, probably in the posterior portion of the superior parietal lobule, was discussed. The writer, however, hesitated to accept the diagnosis of cortical lesion because of the slight ataxia of the *left* arm, which at this time had begun to make its appearance, and also because of the rigidity of the neck. The fact that the iodides and mercurials were so well tolerated suggested, as a possibility, a multiple lesion, one cortical and the other cervical, both due to syphilis. The subsequent progress of the case, however, left no doubt as to a lesion being present in the medulla or cord high up, and this view was shown to be correct by autopsy. The new and striking feature of the case is undoubtedly the astereognosis, and this symptom at first sight suggested, though erroneously, a lesion of the brain.

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[11] Collins, Medical News, 1897, No. II, p. 48.
[12] Collins, Zeitschr. f. Nervenheilk., X, p. 467.
[13] Higier, Zeitschr. f. Nervenheilk., 1898, 13, p. 316.
[14] Wenhardt, Neurolog. Centralbl., 1898, p. 541.
[15] Eskridge, Medical News, 1897, No. II, p. 402.

The writer is under obligations to Dr. William G. Spiller for assistance at the autopsy and for the microscopical work upon the specimens, done in the William Pepper Laboratory of Clinical Medicine.

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148. A CASE OF ACUTE TETANUS TREATED BY INTRA-CEREBRAL INJECTIONS OF ANTITOXIN: RECOVERY. William F. Gibb. (British Medical Journal, No. 1998, page 895, April 15th, 1899.)

The patient was a lad of thirteen years, and the period of incubation sixteen or seventeen days. The first day of the disease he received ten grains of chloral every four hours. At two P. M. on the second day, 10 c.c. of antitetanic serum were administered under the skin, and four hours later, under chloroform anesthesia 8 c.c. were injected into each frontal lobe of the brain and 14 c.c. subcutaneously. At 10.30 he received 10 c.c. under the skin. On the evening of the third day, 10 c.c. were administered hypodermically. During the fourth day the patient was a little better, and on the fifth day, although the tetanic symptoms were about the same, he was quieter. In the evening 10 c.c. of serum were injected into each frontal lobe. The sixth day showed practically no improvement, and he received 20 c.c. hypodermically. The same dose was given the next (seventh) day, and on the eighth day he was quiet and had 20 c.c. of serum in the evening, but the following day he seemed worse and was given 15 c.c. by intracerebral injection. For two days he remained in about the same condition, and then began to improve, making a slow recovery.

The case is open to objection as evidence in support of intracerebral injections, because the serum was given freely under the skin, and because of the comparatively long period of incubation, the prognosis being comparatively favorable under any treatment when the disease does not declare itself within two weeks after the inoculation.

PATRICK.